10/756 443

# FERROELECTRIC MEMORY DEVICE AND METHOD OF FORMING THE SAME

## Related Application

This application is a divisional of U.S. Patent Application No. 10/232,928 filed on August 30, 2002, now ~~pending~~ Patent No. 6,717,196, which is herein incorporated by reference in its entirety.

## Field of the Invention

The present invention relates to a ferroelectric memory device having a ferroelectric capacitor that form a storage cell in a ferroelectric random access memory (FRAM) and to a method of forming the same.

## Background of the Invention

When an external electric field is applied to a ferroelectric substance, a polarization is generated in the ferroelectric substance. After the external electric field is removed, the polarization nevertheless remains broadly therein. Direction of a self-polarization therein can be controlled by changing the external electric field. The ferroelectric substance may be formed by processing a high-dielectric substance such as PZT (Pb(Zi,Ti)O3) or SBT (SrBi2Ta2O9). These properties of the ferroelectric substance are similar to the basic principle on which a conventional, widely-used binary memory operates.

In order to form a ferroelectric cell, a high-dielectric substance such as PZT or SBT is used, the substance having a ferroelectric crystalline structure called "perovskite structure". In a conventional method of forming the perovskite structure, a high-dielectric substance is stacked in an amorphous state, heated to about 700oC in an ambient for oxidization, and crystallized. However, even after the perovskite structure is formed, if a physical impact is applied thereto by anisotropic etching in a subsequent process, or if a certain material such as hydrogen penetrates into the ferroelectric layer by diffusion, a serious inferiority in the properties of the ferroelectric substance may result. Fortunately, such inferiority of the resulting ferroelectric layer may be cured by an annealing process in an oxygen ambient.

When the perovskite structure is formed, or when the subsequent inferiority of the ferroelectric layer is cured, the process condition requires an oxygen ambient and high temperature. If a material such as polysilicon is used to form capacitor electrodes on and under the ferroelectric layer, at least the surface or the interface is oxidized, adversely affecting conductivity and capacitance. Thus, platinum, iridium or another noble metal is